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(54) Title: DATA PROCESSING SYSTEM AND METHOD

(57) Abstract: Embodiments of the present invention relate to a data processing system comprising means to play an interruptible or skipable video sequence; and a random number generator for generating a random number associated with an interruption of the interruptible or skipable video sequence.

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## DATA PROCESSING SYSTEM AND METHOD

### Field of the Invention

The present invention relates to a data processing system and method and, more particularly, to such a system and method for generating random numbers.

### 5 Background to the Invention

Many computer applications call for the use of random numbers, which are employed to give unpredictability to the behaviour of a program. Many computer platforms provide a so-called random number generator, which is typically a RND(N) function that returns a random number in the range of 0 to N-1 (or sometimes 1 to N). It will be appreciated by  
10 those skilled in the art that the word "random" is a misnomer since the random numbers produced are usually created using a linear congruential generator (LCG). An LCG sequence generator calculates a series of numbers,  $r_i$ , of the form  $r_{i+1}=F(r_i)$ . Successive numbers in the number sequence are a function of previous numbers. If the RND(N) function performs fairly, each invocation of the function should yield values 0 to N-1 with equal probability.  
15 Typical, an LCG will have a large period (that is, the sequence will produce a large number of values before it repeats). If an application requires RND(N), where N is relatively small, then the output of the LCG is manipulated to yield a value that lies in the range 0 to N-1. For example, the result of each step of the LCG can be taken to modulo n in order to produce values in the required range. As a consequence, repeated calls of RND(N) can return  
20 repetitions of values before N values have been returned.

The DVD-Video specification as published by the DVD Forum supports a random number function, RND[N], to return a random number within a specified range. However, the specification does not contain any explicit technical guidance to implement this function. It is well known within the industry that some manufacturers have implemented the function  
25 in a way that their DVD players always generate the same random number sequence. Such a situation can occur when an LCG is seeded with a constant value. Consequently, companies engaged in authoring DVD-Video discs cannot assume that a different random number sequence will be generated each time a disc is played. This is particularly problematical for games, such as quizzes, where, for some devices, it can result in the same question sequence  
30 being delivered each time the disc is played.

Another feature of DVD-Video is the counter mode of the GPRM registers. A

GPRM can be placed in counter mode such that its value is incremented by one for each elapsed second from the moment the counter mode is invoked. This feature can be used effectively to seed an LCG with a value that is time-dependent and likely to change as between successive plays of a disc. While this may go some way to overcoming the limitation of players that have a deficient RND implementation, some manufacturers have defective implementations of the counter feature such that registers are incorrectly incremented in contrast to the DVD-Video specification requirements. Furthermore, it is known that there are some DVD players that have defective implementations of both the RND function and the counter mode of the GPRMs.

10 It is an object of embodiments of the present invention at least to mitigate some of the problems of the prior art.

#### Summary of Invention

Accordingly, a first aspect of embodiments of the present invention provides a data processing system comprising means for playing an interruptible or skipable video sequence; and a random number generator for generating a random number associated with an interruption of the interruptible or skipable video sequence.

Advantageously, embodiments of the present invention allow a DVD implementation independent random number generator to be realised that is not beset with at least some of the above mentioned problems.

20 A further aspect of embodiments of the present invention provides a data processing system comprising a reader to read data representing a video sequence and a number of associated data each having a corresponding command; a presentation engine for outputting the video sequence derived from the data representing the video sequence, a navigation engine, responsive to an event, to invoke one of the corresponding commands according to the output of the video sequence; and means to derive a first value from the invoked command of the corresponding commands. It will be appreciated that the reader might form part of a DVD player or DVD drive to read data from a DVD. In preferred embodiments, the first value is used to influence subsequent processing performed by the data processing system. The subsequent processing can comprise, for example, using the value to produce another value such as using the first value as a seed to generate a random number or as a means of influencing the selection of a navigation path which might, in turn, influence video presented by a presentation engine.

A still further aspect of embodiments of the present invention provides a storage medium comprising data representing a video sequence and a number of associated data, each of the associated data having a corresponding command; and data to derive a first value from one of the corresponding commands in response to an event. Preferably, the storage medium is a DVD. In preferred embodiments, the first value is used to influence the subsequent operation of a media player such as, for example, a DVD player or to at least influence a subsequent traversal of the data stored by the medium.

A further aspect of embodiments of the present invention provides an authoring process comprising the steps of associating a plurality of menus, each comprising a button and associated data, with corresponding video units of a plurality of video units representing a video sequence such that each button is actuable during processing of a corresponding video unit to perform at least a corresponding operation defined by the associated data.

It will be appreciated that the plurality of video units, in preferred embodiments, is realised using the groups of pictures data of the MPEG II standard.

Preferred embodiments provide an authoring process in which the corresponding operation is an arithmetic operation. Preferably, the arithmetic operation comprises at least one of an operation selected from the group of (a) generating a value; (b) generating a random number; (c) generating a random number using a supplied seed; and (d) performing an arithmetic operation using a supplied value and a value stored in a register,

Embodiments provide an authoring process in which the associated data comprises a reference to a further video sequence or a further video unit; and the corresponding operation comprises referencing the further video sequence or further unit of video data.

Preferably, embodiments provide an authoring process further comprising the step of encoding the video sequence to produce the plurality of video units. Preferably, the encoding is MPEG II encoding.

A further aspect of embodiments of the present invention provides an authoring process comprising the steps of creating or obtaining a video sequence; creating a plurality of video data from the video sequence; creating a plurality of references to the plurality of video data; creating a plurality of activatable menus, each menu

having at least one invocable button; associating the plurality of menus with respective references of the plurality of references or with respective video data of the plurality of video data; and processing the plurality of video data, the plurality of references and plurality of activatable menus to produce DVD-Video data. Other features of the invention are described below and claimed in the claims.

#### Brief Description of the Drawings

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

figure 1 shows a skipable sequence according to a first embodiment of the present invention;

figure 2 depicts a flowchart according to an embodiment;

figure 3 shows a skipable sequence according to a second embodiment;

figure 4 illustrates a further flowchart according to an embodiment;

figure 5 depicts authoring relationships between assets; and

figure 6 shows a flowchart of an authoring process according to an embodiment

#### Description of the Preferred Embodiments

Figure 1 shows an assembly of data structures 100 used by embodiments of the present invention. The assembly 100 comprises an interruptible or skipable video sequence 102 having a number of Video Object Units structures VOB 1 to VOB N. Each Video Object Units structure VOB 1 to VOB N has an associated button set 104 to 110. It will be appreciated by those skilled in the art that a button set is preferably implemented using menus in accordance with the DVD-Video specification and that the terms "button", "button set", and "button data" all relate to corresponding aspects of DVD-Video menus. Each button set 104 to 110 comprises a respective active button 112 to 118. Each button set 112 to 118 has an associated button command 120 to 126 that is performed in response to a navigation engine (not shown) detecting invocation of a respective active button 112 to 118.

The video sequence 102 and corresponding button sets 104 to 110 are arranged such that only the button set associated with a currently active or currently playing or processed Video Object Units structure is able to be invoked, that is, the button sets are activated selectively or in turn according to whether or not a corresponding portion of a data structure representing, for example, DVD-Video data is being processed. It will be appreciated that this translates into the button sets being active when respective portions of video derived from the portions of video data referenced by the VOBUs data structures. Therefore, for example, the first button set 104 is active during processing of the first Video Object Units structure VOBUs 1 and so on. The button sets 104 to 110 are arranged so that, upon generation, or at least detection, of a user generated event, such as, for example, the user depressing the "OK" button of a remote control (not shown), the corresponding button command 120 to 126 is invoked, that is, a button set comprises a button such as one of buttons 112 to 118 which when activated using a corresponding key of the remote control causes a corresponding button command to be executed. In a preferred embodiment, the buttons of the button sets are all set to the same button. In preferred embodiments, that same button is the "OK" or "Enter" button or an equivalent button. However, embodiments can be realised in which the buttons of the buttons sets correspond to respective buttons of the remote control or other input device, with or without repetition

Prior to playing the initial video sequence 102, one of the GPRMs (not shown) is initialised using a value. Preferably, the initialisation value is a random value generated using, for example, the inherent RND function provided by DVD players, but some other values might equally well be used. The initialised GPRM is then set to counter mode in which the initialised GPRM is periodically incremented automatically. This second step of setting the GPRM to counter mode is optional.

A button command has the following format

ADD<GPRM><value>; LNK<next-sequence>.

This command results in adding the value represented by <value> to the content of register <GPRM>, that is, the register initialised using the random value, and then linking or jumping to the next or a further video sequence identified by <next-sequence>. Preferably, the value of <value> is unique or distinct for each button set of the sequence. In an embodiment, the values chosen for <value> are the same as the VOBUs numbers. Therefore, for example, assuming the user presses "OK" during the processing or playing of the first

Video Object Units structure VOB<sub>U1</sub>, the value 1 is added to the GPRM, during the second Video Object Units structure VOB<sub>U2</sub>, the value 2 is added to the GPRM and so on. Alternatively, the values used for <value> can be non-sequential or, themselves, random numbers such as, for example, a sequence of non-repeating random numbers.

- 5            Preferably, the video sequence 102 is arranged to repeat, which will force the user to press "OK" to advance the programme and a post command is added to the sequence in the form

ADD<GPRM><value2>,

- 10           where <GPRM> is the register initialised previously and <value2> is a further number added to the content of the GPRM upon repetition of the sequence.

If, as is the case in preferred embodiments, the values associated with the button commands are sequential and start from the value "1", it will be appreciated that the value for the m<sup>th</sup> V OBU has the value m. It will be appreciated that ADD<GPRM><value2> is a command that is executed each time the whole of the video sequence 102 has been played.

- 15           When a random number is subsequently required, the previously initialised GPRM is returned to normal register mode and its current value is used as the random number. It will be appreciated that since the point at which a user chooses to skip the video sequence might vary as between plays, it will, typically, result in a different value being contained within the GPRM even on devices that have defective implementations of the RND function and
- 20           defective register counting mode implementations.

- Referring to figure 2, there is shown a flowchart 200 of the steps performed by an embodiment of the present invention. One of the GPRM registers is selected and initialised with a random value using the inherent RND function at step 202. At step 204, the selected GPRM register is set to counter mode. At step 206, the video sequence is played by
- 25           processing the first, or next, VOB<sub>U</sub> structure to access the video sequence or, at least, part of a video sequence by the navigation and presentation engines (not shown) as is conventional within a DVD player. At step 210, which is performed, preferably, very shortly after, before or substantially simultaneously, with step 208, a menu (not shown), comprising the button of the button set corresponding to the currently processed VOB<sub>U</sub> structure, is made active for
- 30           the duration of the video sequence currently being played. A test is performed, at step 212, to determine whether or not a user event such as, for example, the "OK" button (not shown) has

been depressed. If it is determined that a user event has occurred or has been detected, the corresponding button command is invoked at step 214, which will involve adding an appropriate value to the GPRM. The associated LNK aspect of the command is also invoked at step 214, which leads to the playing of the next video sequence at step 216.

5           If the determination at step 212 is negative, a test is performed at step 218 to determine whether or not there are further VOBUs to process. If the determination at step 218 is positive, a test is performed at step 220 to determine whether the most recently processed VOB structure was the last VOB structure associated with the video sequence 102. If the determination at step 220 is negative, processing continues at step 208 where the  
10       next VOB is retrieved and processed. However, if the most recently processed VOB structure was the last such structure associated with the video sequence 102, a predetermined value, <value2>, is added to the GPRM at step 222 and processing then continues at step 208 where the first Video Object Units structure VOB 1 is retrieved again.

          If the determination at step 218 is negative, it is determined at step 224 whether the  
15       video sequence 102 has been arranged to loop or repeat automatically. It will be appreciated in preferred embodiments that the video sequence 102 will be arranged to repeat whereupon processing continues from step 220. However, if the video sequence is not arranged to repeat, processing terminates and the current value of the GPRM is used as the random number or at least as a seed for a random number generator or random number sequence  
20       generator.

          Figure 3 shows an assembly of data structures 300 used by embodiments of the present invention. The assembly 300 comprises an interruptible or skipable video sequence 302 represented by a number of group-of-pictures structures GOP 1 to GOP N. Each group-of-pictures structure GOP 1 to GOP N has an associated button set 304 to 310. Again, it will  
25       be appreciated that the buttons and button sets will be realised using the menu facilities of the DVD-Video specification. Each button set 304 to 310 comprises a respective active button 312 to 318. Each button set 312 to 318 has an associated button command 320 to 326 that is performed in response to a navigation engine (not shown) detecting invocation of a respective active button 312 to 318.

30           The video sequence 302 and corresponding button sets 304 to 310 are arranged such that only the button set associated with a currently active or currently playing or processed group-of-pictures structure is able to be invoked, that is, the button sets are activated



selectively or in turn according to whether or not a corresponding portion of a data structure representing, for example, DVD-Video data is being processed. It will be appreciated that this translates into the button sets being active when respective portions of video derived from the GOPs are being output. Therefore, for example, the first button set 304 is active during processing of the first group-of-pictures structure GOP 1 and so on. The button sets 304 to 310 are arranged so that, upon generation, or at least detection, of a user generated event, such as, for example, the user depressing the "OK" button of a remote control (not shown), the corresponding button command 320 to 326 is invoked, that is, a button set comprises a button such as one of buttons 312 to 318 which when activated using a corresponding key of the remote control causes a corresponding button command to be executed. In a preferred embodiment, the buttons of the button sets are all set to the same button. In preferred embodiments, that same button is the "OK" or "Enter" button or an equivalent button. However, embodiments can be realised in which the buttons of the buttons sets correspond to respective buttons of the remote control or other input device, with or without repetition.

Prior to playing the initial video sequence 302, one of the GPRMs (not shown) is initialised using a value. Preferably, the initialisation value is a random value generated using, for example, the inherent RND function provided by DVD players, but some other values might equally well be used. The initialised GPRM is then set to counter mode in which the initialised GPRM is periodically incremented automatically. This second step of setting the GPRM to counter mode is optional.

A button command has the following format

ADD<GPRM><value>; LNK<next-sequence>.

This command results in adding the value represented by <value> to the content of register <GPRM>, that is, the register initialised using the random value, and then linking or jumping to the next or a further video sequence identified by <next-sequence>. Preferably, the value of <value> is unique or distinct for each button set of the sequence. In an embodiment, the values chosen for <value> are the same as the GOP numbers. Therefore, for example, assuming the user presses "OK" during the processing or playing of the first group of pictures structure GOP1, the value 1 is added to the GPRM, during the second group-of-pictures structure GOP2, the value 2 is added to the GPRM and so on. Alternatively, the values used for <value> can be non-sequential or, themselves, random

numbers such as, for example, a sequence of non-repeating random numbers.

Preferably, the video sequence 302 is arranged to repeat, which will force the user to press "OK" to advance the programme and a post command is added to the sequence in the form

5           ADD<GPRM><value2>,

where <GPRM> is the register initialised previously and <value2> is a further number added to the content of the GPRM upon repetition of the sequence.

If, as is the case in preferred embodiments, the values associated with the button commands are sequential and start from the value "1", it will be appreciated that the value for  
10       the mth GOP has the value m. It will be appreciated that ADD<GPRM><value2> is a command that is executed each time the whole of the video sequence 302 has been played.

When a random number is subsequently required, the previously initialised GPRM is returned to normal register mode and its current value is used as the random number. It will be appreciated that since the point at which a user chooses to skip the video sequence might  
15       vary as between plays, it will, typically, result in a different value being contained within the GPRM even on devices that have defective implementations of the RND function and defective register counting mode implementations.

Referring to figure 4, there is shown a flowchart 400 of the steps performed by an embodiment of the present invention. One of the GPRM registers is selected and initialised  
20       with a random value using the inherent RND function at step 402. At step 404, the selected GPRM register is set to counter mode. At step 406, the video sequence is played by processing the first, or next, GOP structure to produce the video sequence or, at least, part of a video sequence by the navigation and presentation engines (not shown) as is conventional within a DVD player. At step 410, which is performed, preferably, very shortly after, before  
25       or substantially simultaneously, with step 408, a menu (not shown), comprising the button of the button set corresponding to the currently played GOP structure, is made active for the duration of the video sequence currently being played. A test is performed, at step 412, to determine whether or not a user event such as, for example, the "OK" button (not shown) has been depressed. If it is determined that a user event has occurred or has been detected, the  
30       corresponding button command is invoked at step 414, which will involve adding an appropriate value to the GPRM. The associated LNK aspect of the command is also invoked

at step 414, which leads to the playing of the next video sequence at step 416.

If the determination at step 412 is negative, a test is performed at step 418 to determine whether or not there are further GOP structures to process. If the determination at step 418 is positive, a test is performed at step 420 to determine whether the most recently processed GOP structure was the last GOP structure of the video sequence 302. If the determination at step 420 is negative, processing continues at step 408 where the next GOP is retrieved and processed. However, if the most recently processed GOP structure was the last such structure of the video sequence 302, a predetermined value, <value2>, is added to the GPRM at step 422 and processing then continues at step 408 where the first group of pictures structure GOP 1 is retrieved again.

If the determination at step 418 is negative, it is determined at step 424 whether the video sequence 302 has been arranged to loop or repeat automatically. It will be appreciated in preferred embodiments that the video sequence 302 will be arranged to repeat whereupon processing continues from step 420. However, if the video sequence is not arranged to repeat, processing terminates and the current value of the GPRM is used as the random number or at least as a seed for a random number generator or random number sequence generator.

In preferred embodiments, the above calculated number, that is, the number contained within the GPRM is used as a seed value for a LCG algorithm that is used to calculate a non-repeating sequence of pseudo-random numbers, that is, the generated sequence does not contain a repetition of any of the numbers until the whole of the sequence has been generated. However, once the full sequence has been generated, that full sequence will, itself, repeat. Preferably, the value contained within the GPRM is used as the first value,  $r_1$ , in the equation

$$r_{i+1} = (a \cdot r_i + b) \bmod c,$$

where  $c$  is a prime number and  $a$  and  $b$  are constants selected according to a desired level of performance of the LCG, that is, according to the quality of the random numbers required.

It will be appreciated that embodiments can be realised in which multiple video sequences together with respective button sets as described above are used to generate the random number or respective random numbers such that the ultimately used random number is associated with or derived from data associated with those multiple video sequences or the

embodiments are arranged to produce a number of random numbers using the multiple video sequences.

Although the above embodiments have been described with reference to an LCG, embodiments of the present invention are not limited to such LCGs. Embodiments can be realised in which other generators are used. For example, two or more LCGs can be combined to produce a Combined Linear Congruential Generator (CLCG) in which the two LCGs are combined usually by subtraction or ex-or. Still further, Recursive or Extended LCGs can be used to improve the randomness of low order bits that tend to be less random in LCGs. Other generators that might be used, having obtained a seed number, are Multiple Recursive Generators, Inverse Congruential Generators, Combined Inverse Congruential generators, Multiply with Carry Generators, Multiply or Single Feedback shift registers, Generalised Feedback Shift Registers including Twisted Feedback Shift Registers and Multiple GFSR and so on.

Referring to figure 5 there is shown schematically an authoring process 500 according to an embodiment of the present invention. A video stream 502 intended to be output to support generating a desired value, that is, a desired random number, is encoded into a number of units of video data. Preferably, the encoding uses MPEG 2 encoding to produce an MPEG 2 encoded video stream 504 comprising the plurality of groups of pictures GOP 1 to GOP N. Next, a plurality 506 of the video object units VOB 1 to VOB N is created to reference the GOPs GOP1 to GOP N. It can be appreciated that there is a one-to-one relationship between each group of pictures data structure and each VOB reference. However, embodiments of the present invention can be realised in which a single VOB reference relates to one or more than one group of pictures data structure. A button set is created for each VOB. It can be appreciated that a plurality of button sets 508 to 522 are illustrated. It can also be appreciated, for the purposes of illustration only, that button set Mn 520 is associated with three VOBs, that is, VOB X, VOB Y and VOB Z. In this way, a button set, and its corresponding button or buttons, can be made active for a predeterminable period of time. In the illustrated example, button set M 520 is intended to be active for the period of time associated with outputting the video associated with the three VOBs VOB X, VOB Y and VOB Z. The button sets are realised in the form of menus. During the formatting process, the menus, that is, the button sets, arranged to be active during the time when corresponding groups of pictures data structures are being processed to produce corresponding video.

Referring to figure 6 there is shown a flowchart 600 of an authoring process for producing DVD-Video data according to embodiments of the present invention. In step 602 video data representing a desired output sequence during which random number generation is intended to, at least partially, take place, is received or generated.

5           The video data is preferably formatted, at step 604, into groups of pictures data in accordance with the MPEG II standard in preparation for producing DVD-Video specification compatible. The data for the button sets 104 to 110 is received or generated at step 606. Preferably, the data for a button set comprises data identifying or defining a corresponding button that can be activated during an appropriate period and data for linking  
10           to a following video sequence to be output once the corresponding button has been actuated.

At step 608, a plurality of VOBUs is created to reference the GOPs GOP 1 to GOP N. Each of the button sets is associated with a respective VOBV at step 610. The groups of pictures data and the button sets are formatted according to the DVD-Video specification and output for further processing.

15           It will be appreciated that the further processing might comprise, for example, writing of the DVD data to a DLT or a DVD for use in creating a master and subsequent stamp or pressed DVDs for sale, hire or other use.

It will be appreciated that the data used in embodiments of the present invention can be stored on a storage medium for subsequent processing. In preferred embodiments, the  
20           storage medium is at least one of a DVD or a DLT in preparation for producing DVD, with the data representing a video sequence and a number of associated data each having a corresponding command being DVD-Video data.

The first of the above embodiments has been described with reference to button sets being included at the highest resolution allowable by the DVD specification, that is, a button  
25           set is activated for every Video Object Unit (VOBU). However, it will be appreciated by those skilled in the art that some other resolution could be used. For example, the activatable button set might corresponding to a predeterminable number, such as, for example, two or some other number, of VOBUs. Furthermore, the first embodiment has been described with reference to VOBUs. It will be appreciated that this has been done for the purpose of  
30           describing an embodiment that is compliant with the current DVD specifications. However, it will be appreciated that other embodiments can be realised that use buttons sets in relation to some other unit of picture data such as, for example, the Groups of Pictures data used in

the second embodiment.

Although the above embodiments have been described with reference to the user-generated event being generated in response to actuation of an "OK" button, embodiments are not limited thereto. Embodiments can be realised in which actuation of any button can be  
5 sufficient to generate the requisite user generated event.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

10 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings) and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims,  
15 abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of any foregoing embodiments. The  
20 invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

## CLAIMS

1. A data processing system comprising a reader to read or process data representing a video sequence and a number of associated data each having a corresponding  
5 command; a presentation engine for outputting the video sequence derived from the data representing the video sequence, a navigation engine, responsive to an event, to invoke one of the corresponding commands according to the output of the video sequence; and means to derive a first value from the invoked command of the corresponding commands.
- 10 2. A data processing system as claimed in claim 1 in which the data representing the video sequence comprises a plurality of data structures; each of the data structures being associated with a respective one of the corresponding commands.
3. A data processing system as claimed in claim 2 in which the plurality of data structures comprises a plurality of Group-of-Pictures structures.
- 15 4. A data processing system as claimed in any preceding claim in which the associated data comprises at least a command to influence the operation of at least one of the navigation engine and the presentation engine.
5. A data processing system as claimed in any preceding claim in which the corresponding commands comprise associated values used to produce the first value.
- 20 6. A data processing system as claimed in any preceding claim in which the corresponding commands comprise respective navigation commands associated with data representing a further video sequence.
7. A data processing system as claimed in claim 6 in which the navigation commands retrieve the data representing the further video sequence and cause the presentation  
25 engine to derive the further video sequence from the data representing the further video sequence.
8. A data processing system as claimed in any preceding claim in which the means to derive the first value comprises a register arranged to store a time varying value generated during the output of the video sequence by the presentation engine.

9. A data processing system as claimed in claim 8 in which the register is a GPRM register set to counter mode.
10. A data processing system as claimed in either of claims 8 and 9 in which the means to derive the first value comprises a combiner to combine the time varying value of the register with data associated with the invoked command.
11. A data processing system as claimed in claim 10 in which the combiner comprises an adder to add the time varying value of the register to the data associated with the invoked command.
12. A data processing system as claimed in any preceding claim in which the means to derive the first value further comprises means to derive the first value from an initialisation value.
13. A data processing system as claimed in claim 12 in which the initialisation value is generated by a random number generator.
14. A data processing system as claimed in any preceding claim further comprising means to generate a sequence of values from the first value.
15. A data processing system as claimed in claim 14 in which the means to generate the sequence comprises means to generate the sequence with a predeterminable number of non-repeating values.
16. A data processing system as claimed in either of claims 14 and 15 in which the means to generate the sequence comprises a calculator to perform an iterative operation to calculate the values of the sequence.
17. A data processing system as claimed in claim 16 in which iterative operation calculates  $r_{i+1} = ar_i + b \bmod c$ , where  $a$  and  $b$  are constants,  $r_1$  is the first value and  $c$  is prime.
18. A storage medium comprising data representing a video sequence and a number of associated data each having a corresponding command; and data to derive a first value from one of the corresponding commands in response to an event.
19. A storage medium as claimed in claim 18 in which the data representing the video sequence comprises a plurality of data structures; each of the data structures being



associated with a respective one of the corresponding commands.

20. A storage medium as claimed in claim 19 in which the plurality of data structures comprises a plurality of Group-of-pictures structures.
21. A storage medium as claimed in claim 20 in which the associated data comprises at least a command to influence the operation of at least one of a navigation engine and a presentation engine.
22. A storage medium as claimed in any of claims 18 to 21 in which the corresponding commands comprise respective navigation commands associated with data representing a further video sequence.
23. A storage medium as claimed in any of claims 18 to 22 in which the navigation commands retrieve the data representing the further video sequence and cause the presentation engine to derive the further video sequence from the data representing the further video sequence.
24. A storage medium as claimed in any of claims 18 to 23 further comprising a command to arrange for a register to produce a time varying value during output of the video sequence by the presentation engine.
25. A storage medium as claimed in claim 24 in which the command to arrange for the register to produce the time varying value comprises a command to cause a GPRM to assume a counter mode.
26. A storage medium as claimed in either of claims 24 and 25 further comprising data to derive a first value, in response to an event, from one of the corresponding commands.
27. A storage medium as claimed in any of claims 24 to 26 in which the data to derive the first value further comprises data to derive the first value from an initialisation value.
28. A storage medium as claimed in claim 27 in which the initialisation value is generated by a random number generator.
29. A storage medium as claimed in any of claims 24 to 28 further comprising data to generate a sequence of values from the first value.

30. A storage medium as claimed in claim 29 in which the data to generate the sequence comprises data to generate a sequence comprising a predeterminable number of non-repeating values.
31. A storage medium as claimed in either of claims 29 and 30 in which the data to generate the sequence comprises a command to perform an iterative operation to calculate the values of the sequence.
32. A storage medium as claimed in claim 31 in which the iterative operation calculates  $r_{i+1} = ar_i + b \bmod c$ , where  $a$  and  $b$  are constants,  $r_1$  is the first value and  $c$  is prime.
33. A storage medium as claimed in any of claims 18 to 32, in which the medium is a DVD.
34. A data processing system as claimed in any of claims 1 to 17 in combination with a storage medium as claimed in any of claims 18 to 33.
35. A data processing system comprising means to play an interruptible or skipable video sequence; and a random number generator for generating a random number associated with an interruption of the interruptible or skipable video sequence.
36. A data processing method comprising the steps of playing an interruptible or skipable video sequence; and generating a random number associated with an interruption of the interruptible or skipable video sequence.
37. A data processing system substantially as described herein with reference to and/or as illustrated in the accompanying drawings.
38. A storage medium substantially as described herein with reference to and/or as illustrated in the accompanying drawings.
39. An authoring process comprising the steps of associating a plurality of menus, each comprising a button and associated data, with corresponding video units of a plurality of video units representing a video sequence such that each button is actuatable during processing of a corresponding video unit to perform at least a corresponding operation defined by the associated data.
40. An authoring process as claimed in claim 39 in which the corresponding operation is an arithmetic operation.

41. An authoring process as claimed in claim 40 in which the arithmetic operation comprises at least one of an operation selected from the group of (a) generating a value; (b) generating a random number; (c) generating a random number using a supplied seed; and (d) performing an arithmetic operation using a supplied value and a value stored in a register,
42. An authoring process as claimed in any of claims 39 to 41 in which the associated data comprises a reference to a further video sequence or a further video unit; and the corresponding operation comprises referencing the further video sequence or further unit of video.
43. An authoring process according to any of claims 39 to 42 further comprising the step of encoding the video sequence to produce the plurality of video units.
44. An authoring process comprising the steps of creating or obtaining a video sequence; creating a plurality of video data from the video sequence; creating a plurality of references to the plurality of video data; creating a plurality of activatable menus, each menu having at least one invocable button; associating the plurality of menus with respective references of the plurality of references or with respective video data of the plurality of video data; and processing the plurality of video data, the plurality of references and plurality of activatable menus to produce DVD-Video data.
45. An authoring process substantially as described herein with reference to and/or as illustrated in the accompanying drawings.
46. An authoring system comprising means for implementing an authoring process as claimed in any of claims 39 to 45.
47. A computer program comprising computer readable code to implement a method, system, or process as claimed in any preceding claim.
48. A storage medium storing a computer program as claimed in claim 47.

Figure 1

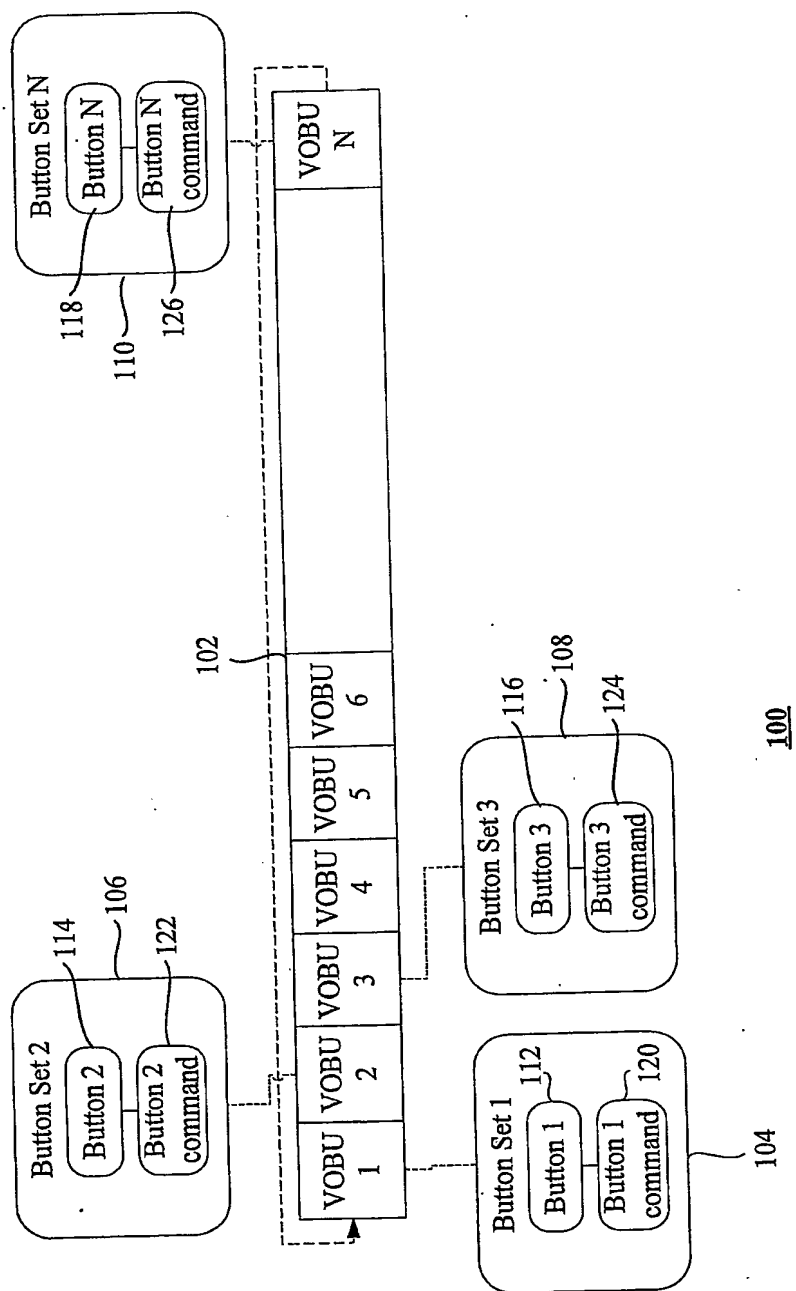


Figure 2

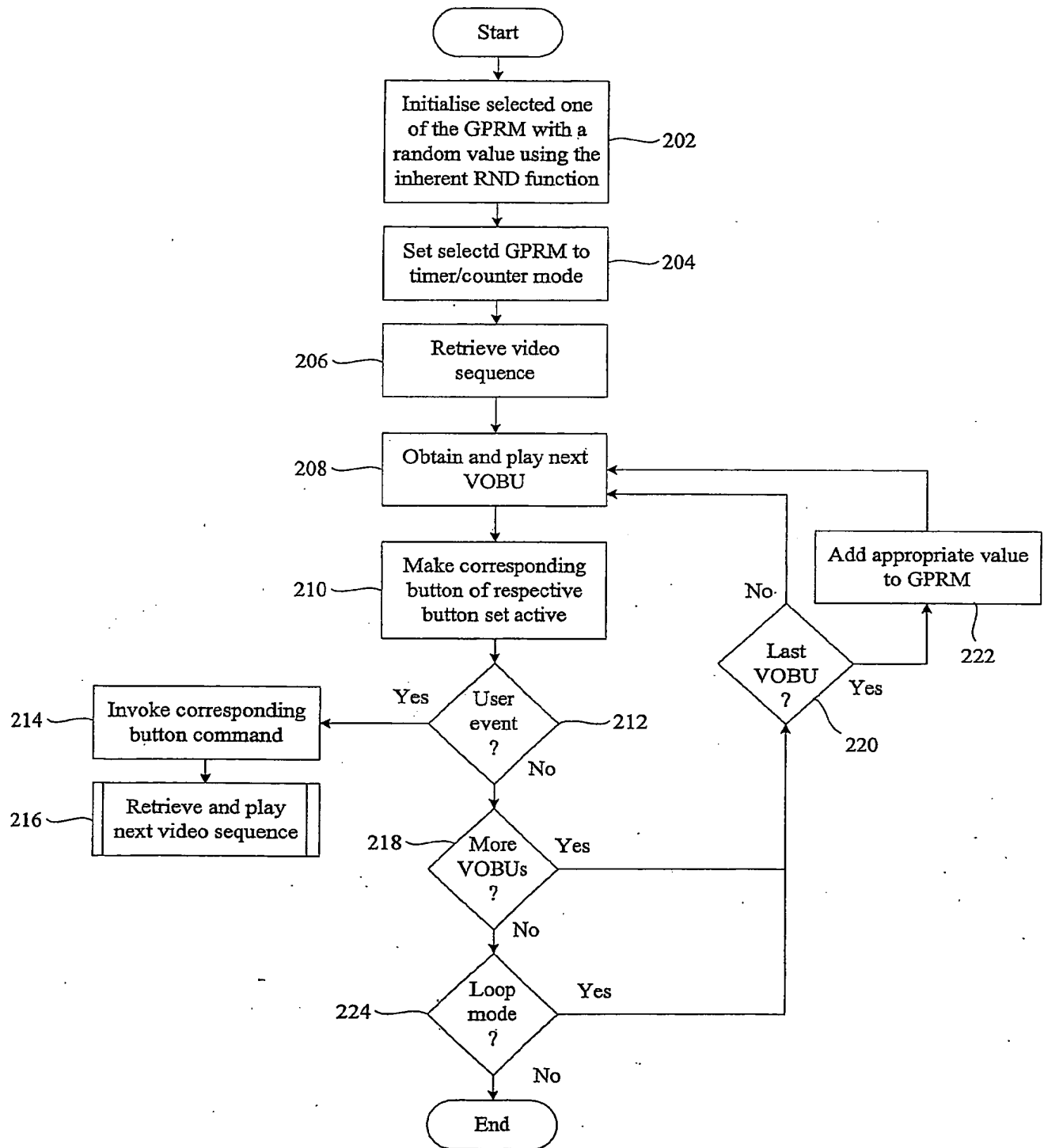


Figure 3

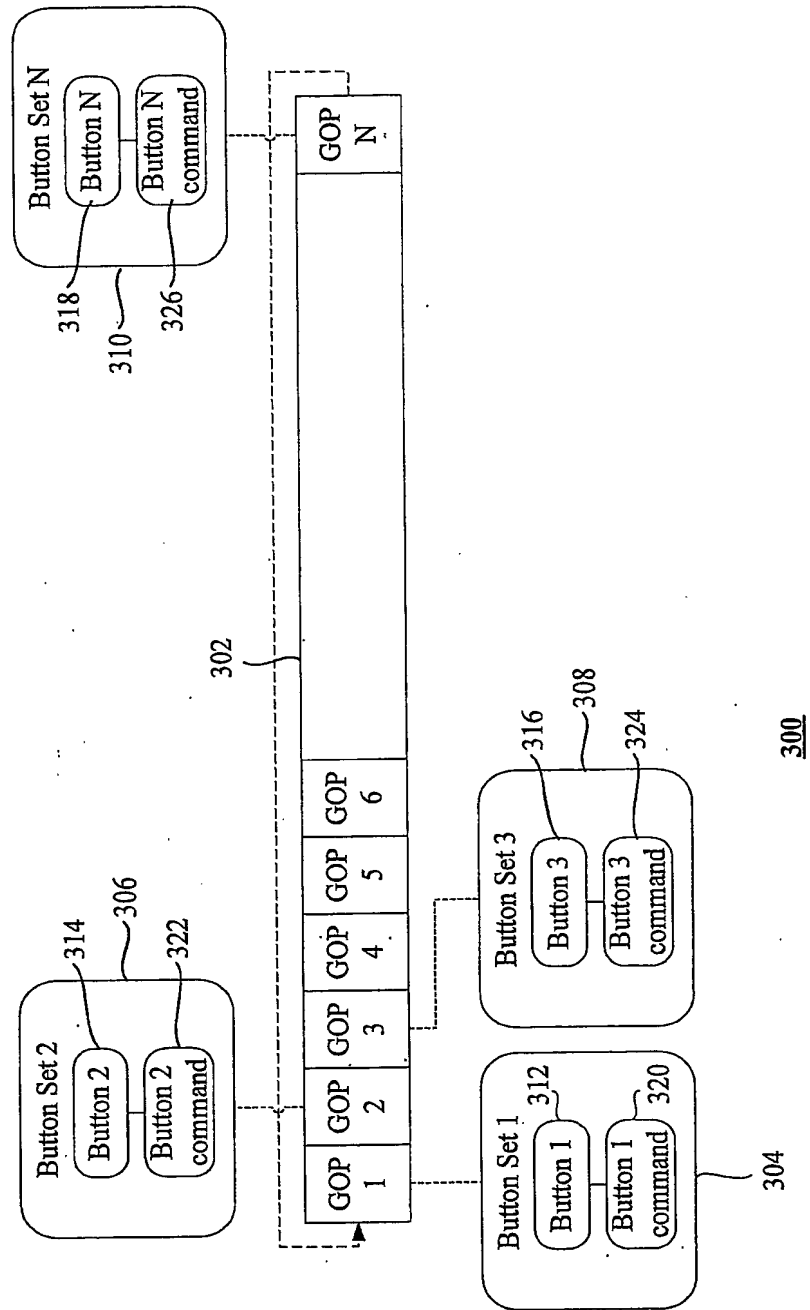


Figure 4

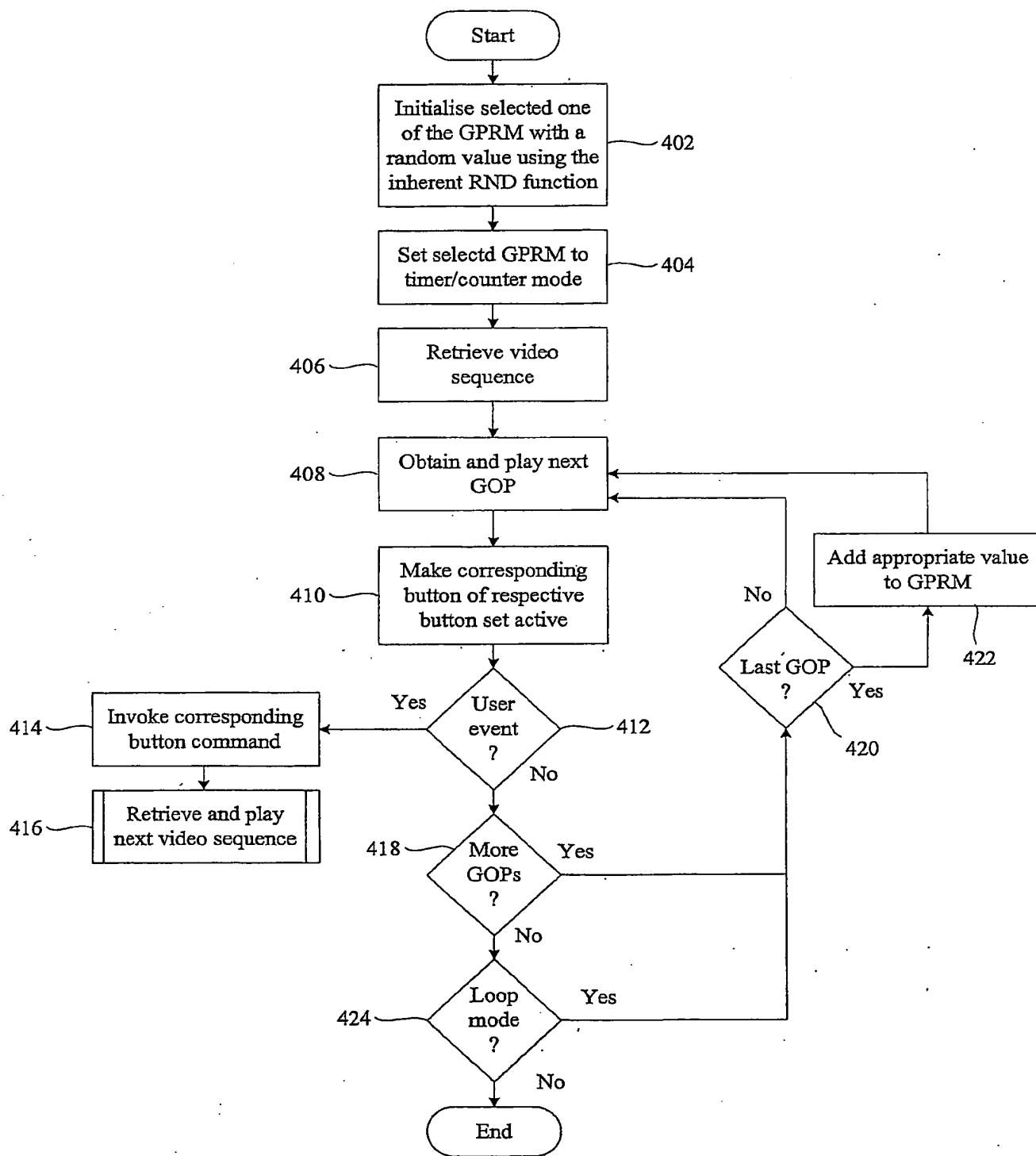
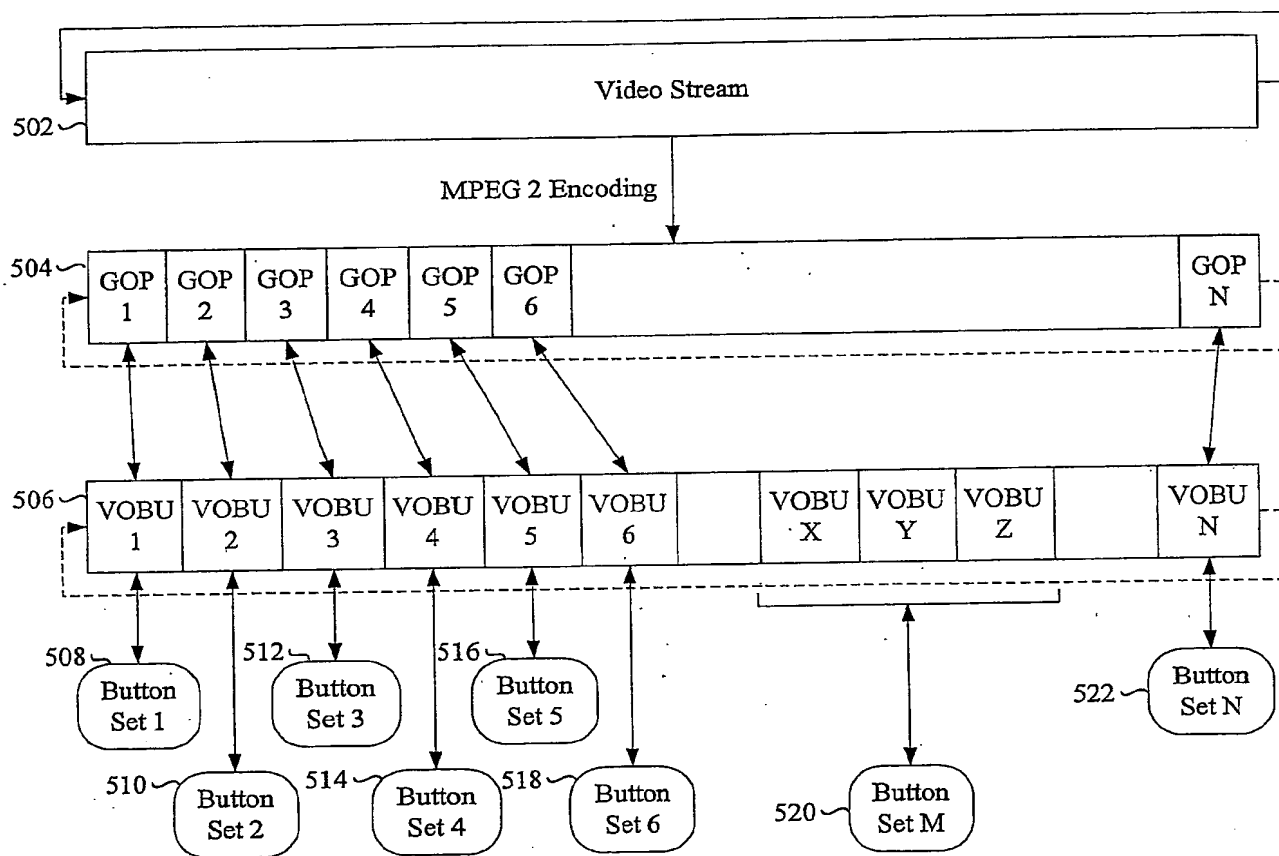


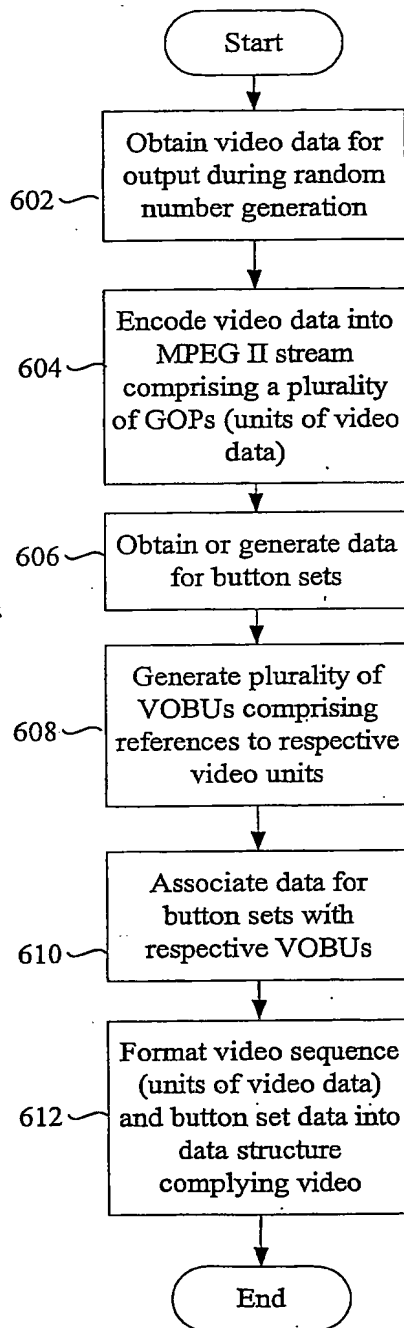
Figure 5





6/6

Figure 6



REVISED VERSION

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# PATENT COOPERATION TREATY

# PCT

## DECLARATION OF NON-ESTABLISHMENT OF INTERNATIONAL SEARCH REPORT

(PCT Article 17(2)(a), Rules 13ter.1(c) and Rule 39)

Applicant's or agent's file reference <b>P102489WO</b>	<b>IMPORTANT DECLARATION</b>	Date of mailing(day/month/year) .. <b>14/02/2005</b>
International application No. <b>PCT/GB2004/002900</b>	International filing date(day/month/year) <b>05/07/2004</b>	(Earliest) Priority date(day/month/year) <b>03/07/2003</b>
International Patent Classification (IPC) or both national classification and IPC <b>G11B27/10</b>		
Applicant... <b>ZOOTECH LIMITED</b>		

This International Searching Authority hereby declares, according to Article 17(2)(a), that **no international search report will be established** on the international application for the reasons indicated below

1. ☐ The subject matter of the international application relates to:
  - a. ☐ scientific theories.
  - b. ☐ mathematical theories
  - c. ☐ plant varieties.
  - d. ☐ animal varieties.
  - e. ☐ essentially biological processes for the production of plants and animals, other than microbiological processes and the products of such processes.
  - f. ☐ schemes, rules or methods of doing business.
  - g. ☐ schemes, rules or methods of performing purely mental acts.
  - h. ☐ schemes, rules or methods of playing games.
  - i. ☐ methods for treatment of the human body by surgery or therapy.
  - j. ☐ methods for treatment of the animal body by surgery or therapy.
  - k. ☐ diagnostic methods practised on the human or animal body.
  - l. ☐ mere presentations of information.
  - m. ☐ computer programs for which this International Searching Authority is not equipped to search prior art.
2. ☒ The failure of the following parts of the international application to comply with prescribed requirements prevents a meaningful search from being carried out:
 

☒ the description
☒ the claims
☐ the drawings
3. ☐ The failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions prevents a meaningful search from being carried out:
 

☐ the written form has not been furnished or does not comply with the standard.
 ☐ the computer readable form has not been furnished or does not comply with the standard.
4. ☐ The failure of the tables related to the nucleotide and/or amino acid sequence listing to comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions prevents a meaningful search from being carried out:
 

☐ the written form has not been furnished.
 ☐ the computer readable form has not been furnished or does not comply with the technical requirements.
5. Further comments: see further information PCT/ISA203

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  <b>Patricia Klingens-Herklots</b>
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## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 203

The application claims a data processing system and method for which the only embodiments found in the description are a DVD system and method, as is confirmed by the statements found in the description: "a button set is preferably implemented using menus in accordance with the DVD-video specification" (p. 4, l. 23-24), "the initialisation value is a random value generated using, for example, the inherent function provided by DVD players" (p. 5, l. 20-21), "at step 206 the video sequence is played by processing the first, or next, VOB structure to access the video sequence or, at least, part of a video sequence by the navigation and presentation engines (not shown) as is conventional within a DVD player" (p. 6, l. 24-27), "using the menu facilities of the DVD-video specification" (p. 7, l. 25-26), "the groups of pictures are formatted according to the DVD-Video specification and output for further processing" (p. 12, l. 13-14), "highest resolution allowable by the DVD specification" (p. 12, l. 24), "compliant with the current DVD specification", (p. 12, l. 30). As a consequence, at least some features of the claimed system, and steps of the claimed method are not disclosed explicitly in the description which should be complemented with the DVD-video specification.

The DVD-video specifications being sold under a Non Disclosure Agreement, they are not available to the public and do not form part of the prior art, nor of the common knowledge of the skilled person, and cannot complement the description.

Same applies to claimed storage medium, computer program and medium storing the computer program, and authoring process.

Therefore, the claims are adequately supported by the description, and no meaningful opinion can be formed on the novelty and inventive step of the claimed invention (article 34(4) (a) (ii) PCT).

Moreover, for the same reasons, the description does not disclose the best mode for carrying out the claimed invention, contrary to Article 5 PCT.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.